Medical Technology
Nuclear-Medicine
Nuclear Medicine Technology Certification Exam

Latest Version: 6.0

Question: 1

Quality control procedures that must be performed on scintillation detectors include all of the following, EXCEPT:

A. Linearity
B. Constancy
C. Calibration
D. Chi-square

Answer: A

Explanation:
The scintillation detector consists of a well counter and an uptake probe coordinated with a common computer. Quality control tests include calibration, energy resolution, chi-square, efficiency, and sensitivity. The last test, sensitivity, is equated with constancy, because the detector's ability to detect a given energy,' level should remain consistent from day to day. Calibration sets the operating voltage, whereas chi-square is a statistical test used to determine whether variations between test counts fall within acceptable parameters. Linearity is a test performed on dose calibrators, rather than on scintillation detectors. Energy resolution refers to the instrument's capacity to distinguish differences in the radiation energy that is detected.

Question: 2

Positron emission tomography (PET) scanners require various quality control tests. Which of the following is NOT a test required for PET gamma cameras?

A. Blank scan
B. Absolute activity calibration
C. Relative activity calibration
D. Normalization

Answer: C

Explanation:
Quality control tests of the gamma cameras used in positron emission tomography (PET) scanners include blank scans, normalization, and calibration of absolute activity. The blank scan is a test of the camera's sensitivity to gamma radiation produced from annihilation between electrons and the positrons from positron emitters directly, as opposed to when such compounds are given to patients. Normalization is a test of the efficiency of PET projection systems. Absolute activity is a calibration that compares the energy detected by the gamma camera with the dosage of the positron emitter given to a patient. Relative activity is a measure of how active different tissues

appear to the gamma camera. This is what a typical PET scan measures, and thus it is not a calibration test.

Question: 3

Testing of surgical gamma probes, used in surgical procedures to detect malignant tissue that has been labeled with radiopharmaceuticals, requires which of the following?

A. A sample of cobalt-57 as a standard radioactive source
B. Radiation activity range of 10 to 50 micro curies (gCi)
C. Radiation frequency range of 1020 to 1022 hertz (Hz)
D. None of the above

Answer: A

Explanation:
A gamma surgical probe is a gamma radiation sensor that is used to locate tissue that has been marked with a radiopharmaceutical, most often to identify the tissue as malignant. The probe has gamma-detecting crystal at the tip that is shielded but for a narrow opening in the front to allow for good localization of the gamma-emitting sources within a patient. Typically, radiopharmaceuticals using gamma emitters such as technetium-99m or indium-III are used. Cobalt-57 (^{57}Co) is used as a standard radioactive source for quality control testing. A radiation activity range of 5 to 25 micro curies (µCi) should be tested, or 185 to 925 kilobecquerels (kBq) in S1 units. The frequency of the gamma radiation is inherent to the ^{57}Co atom, and thus the frequency range does not have to be tested.

Question: 4

Diagnostic nuclear medicine procedures include all of the following, EXCEPT:

A. Bone scan
B. Magnetic resonance imaging (MRI)
C. Positron emission tomography (PET)
D. Myocardial perfusion scanning

Answer: B

Explanation:
Nuclear medicine procedures are those that involve the use of radionuclide's, or radiopharmaceuticals. A bone scan uses a gamma-emitting tracer to highlight areas of activity such as bone remodeling and inflammation, all of which can be signs of disease. Positron emission tomography (PET) scanning uses positron-emitting tracers to various types of metabolic activity. One common type of activity that is tested with PET is glucose uptake. Myocardial perfusion scanning uses a gamma-emitting radionuclide that is taken in by heart muscle. When not used in concert with radionuclide-based procedures such as PET, magnetic resonance imaging (MRI) is not a nuclear medicine procedure, because radionuclide's are not part of its function.

Question: 5

Which of the following is an appropriate time interval that should pass between the administration of oral radioactive iodine and the performance of a thyroid scan?

A. 30 minutes
B. 2 hour
C. 5 hours
D. 48 hours

Answer: C

Explanation:
A thyroid scan uses Scintigraphy to measure gamma radiation coming from radioactive iodine given as a tracer. Typically administered in oral form, the radioactive iodine makes its way to the thyroid. The more active the thyroid tissue is, the higher the absorption of the tracer and the higher the signal detected by the gamma camera. Areas of the gland with varying activities can be distinguished based on their appearance in the scan. Areas where activity is unusually high are called "hot," whereas areas that are unusually inactive are called "cold." Both hot and cold areas can be signs of disease. There is a waiting period following the administration of the tracer, as the tracer takes time before the optimal amount has been absorbed by thyroid tissue. Scans can be performed as soon as 4 to 6 hours after tracer administration, and often the scan is performed 24 hours later. Sometimes a first scan is performed at 4 to 6 hours after tracer administration and another scan at 24 hours, but 48 hours would be too long of a wait.

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